

INTRODUCTION

Key Terms

Shoreline: the physical interface between land, air, and water.

Shorezone: the land area that extends from an estuarine shoreline landward to where the hydrologic influence of sea level diminishes and terrestrial hydrology dominates.

Ecosystem goods and services: the end products of natural ecosystems that yield human well-being and value (e.g., fish from the sea, beauty of the coast). Conditions that define an ecosystem service include: (1) the service originates from the natural environment; (2) the service enhances human well-being; and (3) the service is an end product of nature directly used by people.

Affected by a diversity of natural and anthropogenic processes, coastal areas are dynamic systems that are heavily populated. Excluding Alaska, coastal counties comprise 17% of the nation's land, yet they contain over 50% of the United States population (based on 2003 census data, Crossett et al. 2004). Crossett et al. (2004) determined that the national average population density (excluding Alaska) is 98 people per square mile for non-coastal counties, as compared to 300 persons per square mile for coastal counties. Consequently, the development and management of coastal areas is of great concern, especially in light of our demonstrably changing climate.

Sea-level variation is an important consequence of climate change, both for society and the environment. Estimates of global sea-level rise (SLR) for the 21st century ranges from 0.3 to 2.9 feet, but locally sea-level rise may be much higher or lower due to factors such as subsidence, sediment compaction, or uplift (IPCC, 2007). Many coastal areas will experience increased levels of flooding, accelerated

erosion, loss of wetlands and low-lying terrestrial ecosystems, and seawater intrusion into freshwater sources as a result of SLR and potentially enhanced storm frequency and severity. Prediction of shoreline retreat and land loss rates is critical for planning of future coastal zone management strategies, and to assess biological impacts due to habitat changes and loss (Thieler and Hammer-Klose, 1999).

The Albemarle-Pamlico Estuarine System (APES) of North Carolina is the second largest estuary in the United States and contains extensive estuarine marshes that provide critical habitat for a variety of ecosystem goods and services. Based on tide gauge measurements analyzed by the National Ocean and Atmospheric Administration (NOAA, 2004), the measured rate of relative SLR in North Carolina ranges from 0.07 to 0.17 inches per year with rates increasing from south to north. The rise in sea level coupled with storms over the last several decades already has had major impacts on North



Figure 1. Images of shoreline recession in the modern northeastern North Carolina estuarine coastal system as a result of storm processes and ongoing sea-level rise.